PROBLEM CORNER

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Example 1 *We are given a circle C with radius r_0 and centered at $O = (0, 0)$, and an ellipse of the form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, that is outside the given circle. Let A be a moving point on the circle. Suppose we construct the line OA to intersect at a point B on the ellipse. We construct the line l_1 passing through B and is parallel to $y-axis$. Next we construct the line l_2 passing through the point A and is parallel to $x-axis$. (a) Find the locus for the point P that is the intersection between l_1 and l_2 (See Figure 1). (b) Maximize the area of ABP.*

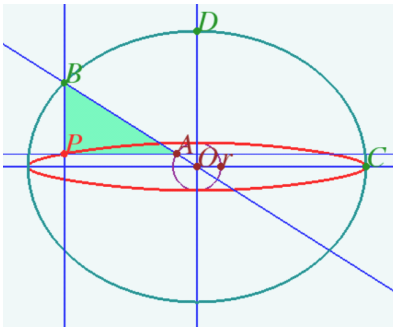

Figure 1. Find the locus for the point P.

Example 2 *We are given a circle C^* centered at $O = (0, 0)$ with radius r_0, and a cardioid which resembles the shape of $r = a(1 - \cos\theta)$, where $\theta \in [0, 2\pi]$ enclosing the given circle C^* as shown in Figure 2(a). We are given a moving point A on the circle. Suppose we construct the line OA to intersect at a point B on the cardioid. We construct the line l_1 passing through B and is parallel to $y - axis$. Next we construct the line l_2 passing through the point A and is parallel to $x - axis$. Find the locus for the point P that is the intersection between l_1 and l_2.*

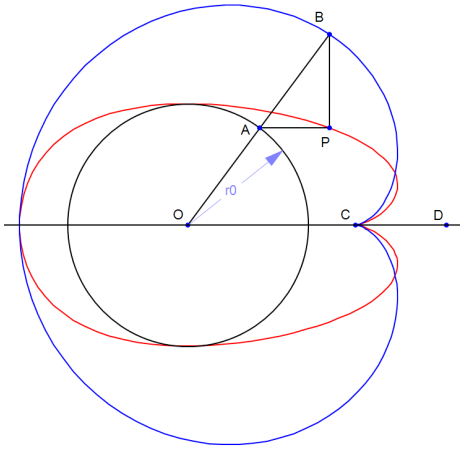

Figure 2(a) Find the locus for the point P.